



ENGINEERS GUIDE TO LUBRICANTS FOR DELICATE MECHANISMS

NON-SPREADING SYNTHETIC OILS • DOLPHIN OIL FORMULATIONS • SYNTHETIC
WIDE-TEMPERATURE OILS • LOW-SHEAR INSTRUMENT GREASES • BARRIER
FILMS TO PREVENT OIL CREEP • DAMPING GREASES

SELECTION OF A PROPER LUBRICANT

This introduction to Nye's product line sets forth a general guide to suitable oils and greases for a wide variety of delicate mechanisms. The devices listed below are selected as typical and not inclusive of the great variety of delicate machinery, where the combination of tolerances, torque, materials, and small size as well as the need for long and unattended operating life requires specialty lubrication.

APPLICATION GUIDE

APPLICATION GUIDE		Non-Spreading Oils		Dolphin Head Oils		Other Instrument Oils			Instrument Greases			Specialties						
LUBRICANT →	MECHANISM ↓	Fulchem Oil 461	Fulchem Oil 456	Nye Superior Clock Oil	Nye Superior Watch Oil	Nye Bracelet Watch Oil	L-3 Delicate Machine Oil	Synthetic Oil 200	400 Series Synthetics	600 Series Synthetics	Nyoil	Synthetic Grease 710	NyoGel 725	NyoGel 1020	Rheolube 745	Rheolube 772	Damping Grease 766	NyeBar Barrier Films
	Clocks and timers, incl. parking meters																	
	—Escapements and pivots																	
	—Mainsprings																	
	Oven timers																	
	Watches																	
	—Escapements and pivots																	
	—Mainsprings																	
	Jeweled-bearing devices																	
	Speedometers																	
	Miniature ball bearings																	
	—Low temperature uses																	
	—Extreme low power uses																	
	—Migration constraints																	
	Aircraft instruments																	
	Meteorological instruments																	
	Time fuze mechanisms																	
	Potentiometers																	
	Instrument motors																	
	Instrument gear trains																	
	Recorder mechanisms																	
	Computers—peripheral mechanisms																	
	Business machines and calculators																	
	Typewriters																	
	Vending machines																	
	Alarm mechanisms																	
	Counters																	
	Vault mechanisms																	
	Cameras and components																	
	Microscopes and related optical instruments																	
	Surveying transits																	
	Micrometers																	
	Scales and balances																	
	Drafting tools																	
	Sewing machines																	
	Electric controls																	
	Electrical contacts																	
	Gear boxes																	
	Open gears and rack and pinion mechanisms																	
	Low-speed slides and cams																	
	—Ordinary loads																	
	—Heavy loads																	
	Sintered bearing impregnating oils																	
	—Temps., 0°F. to 150°F.																	
	—Temps., over 150°F.																	

See Reverse Side for Summary of Physical Properties

Refiners of Precision

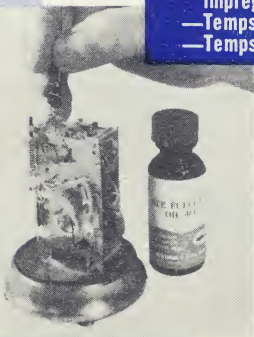
William F. Nye, Inc.

Lubricants Since 1844

P. O. BOX G-927
New Bedford, Mass. 02742
Phone (617) 992-1327



Plant at
10 Howland Road
Fairhaven, Mass.



LOOKING BACK TO THE WHALING ERA

EZRA KELLEY AND WILLIAM NYE

Early in the nineteenth century, while experimenting with various fatty oils for use in clocks and chronometers, Ezra Kelley (1798-1895) a New Bedford clockmaker, came by chance upon a byproduct of some now forgotten whaling voyage, the head oil from a dolphin caught for food or sport. A triglyceride like all fats, this oil was unique in its low temperature properties and in its stability against oxidation or gumming. Kelley's experiments with this oil produced a startling improvement in clock lubrication; and, by the latter half of the 1800's, the use of dolphin head or porpoise jaw oil for timepiece lubrication had virtually become standard, not only in the United States but throughout Europe as well.

W. F. Nye (1824-1910) a colorful Yankee and a veteran of Far Eastern travels and the California Gold Rush, extended his business interests to oil refining in New Bedford in 1866. From 1877 to 1939, the Nye Oil Works on Fish Island in New Bedford Harbor was a notable landmark. By 1890 he had built his firm into the world's largest manufacturer of sewing machine, watch and clock oils.

SOURCES OF THE DOLPHIN OILS

Most of the smaller toothed whales, including dolphins and porpoises, have small quantities of oil in cavities in the head, especially in the brain "melon" and in the glands of the jaw hinges. The most productive source is the melon of the "blackfish" or pilot whale. At one time Nye depended for a supply on strandings along the coasts of Massachusetts Bay and Buzzards Bay and on Cape Cod. During the early decades of this century the company operated an unusual "porpoise fishery" on the Hatteras Banks of North Carolina. There the animals were caught in huge seines which were dragged through the surf to shore. Today, William F. Nye, Inc., obtains blackfish head oil produced as a byproduct of larger commercial whale-harvesting enterprises in Canada and the West Indies. The oil is intensively refined and purified at the company plant in Fairhaven, Mass.

NYE LUBRICANTS A SUMMARY OF PHYSICAL PROPERTIES

INSTRUMENT OILS

OIL LABEL	COMPOSITION	VISCOSITY at 100°F.	LOW TEMP. VISCOSITY °F.; cs.	POUR Pt. °F.	FLASH Pt. °F.	EVAPORATION TENDENCY Hrs. °F.; LOSS
Fulchem Oil 461	Phenylated ether	17.4	-15; 22000	-20	395	22; 210; 0.3%
Superior Clock Oil	Dolphin oil blend	21.5	-20; 2850	-25	377	22; 210; 1.3%
Superior Watch Oil	Dolphin oil blend	17.6	-20; 1450	-25	365	22; 210; 1.6%
Bracelet Watch Oil	Dolphin oil blend	15.6	-20; 2900	-22	370	22; 210; 1.5%
Delicate Mach. Oil L-3	Dolphin oil blend	38.5	-20; cryst.	-29	392	100; 250; 2.4%
Instrument Oil 200	Diester	13.5	-65; 4430	-80	430	22; 210; 0.7%
400 Series Oils (403)	Polyglycol	35.4	-30; 14600	-50	420	22; 210; 0.4%
600 Series Oils (622)	Polyol ester	60.0	-30; 16200	-60	525	6½; 400; 2.5%
NyoSil	Halog. silicone	55.0	-65; 2700	-100	550	24; 302; 0.4%
Nyoil	Petroleum	36.5	0; 1800	-25	400	22; 210; 1.8%

INSTRUMENT GREASES

GREASE LABEL	COMPOSITION	DROPPING Pt. °F.	PENETRATION UNWKD. WKD.*		BOMB OXIDATION Hrs. °F. PRESS.	EVAPORATION TENDENCY Hrs. °F.; LOSS
Instrument Grease 710	Diester-lithium soap	365	293	288	100; 210; -2 psi	22; 250; 1.0%
NyoGel 725	Dolphin blend-inorg.	over 500	812	849	100; 210; None	22; 250; 6.0%
NyoGel 1020	Dolphin blend-carbon	over 500	390	400	100; 210; None	22; 250; 3.2%
Rheolube 745	Ester-dolphin-inorg.	500	378	405	100; 210; -1 psi	22; 210; 1.9%

(*60 strokes)

SPECIALTY PRODUCTS

PRODUCT LABEL	COMPOSITION	GENERAL DESCRIPTION
NyeBar-Type C	Fluorochemical	Prevents migration of all oils to 400°F.
NyeBar-Type H	Fluorochemical	Prevents migration of non-ester type oils to 250°F.
Damping Grease 766	Silicone-silica	High tack, non-melting grease for surveying transits
Rheolube 772 Grease	Hydrocarb.-inorg.	Medium tack, long-life, non-melting grease for microscopes
NyeFilm	Petroleum film	Ultra-thin rust preventive coating
NyeSolve	Fluorochemical	Premium quality cleaning solvent for fine instruments

CUSTOM FORMULATIONS

Needs for delicate mechanisms are so varied that many applications must be considered unique in their demands, and custom formulations are required. William F. Nye, Inc., attempts to provide a special lubricant for any special problem. The above table and the Nye Catalog summarize a series of products representative of the more successful basic solutions to a wide variety of lubrication problems. However, the listed products should be considered only suggestive of the range of materials which can be made available. Inquiries on special problems are welcomed and will receive prompt attention.



NYE PRODUCT BULLETIN

LUBRICANTS FOR DELICATE MECHANISMS

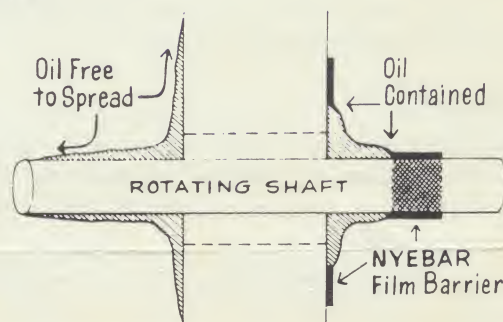
APRIL, 1966

PB No. 6606 (Supersedes
PB 6503 and 6605)

NYEBAR BARRIER FILMS

TO RETARD OIL SPREADING

THE NYEBAR SOLUTIONS CONTAIN RESINS WHICH ADHERE AS THIN FILMS TO SOLID SURFACES. UPON EVAPORATION OF THE CARRIER SOLVENT, A LOW SURFACE ENERGY COATING IS LEFT WHICH ACTS AS A BARRIER TO MIGRATION OF FLUIDS.



PRINCIPLE OF EFFECTIVENESS

Liquids will spread upon or "wet" any surface where surface energy is higher than the surface tension of the fluid. Thus, because of the very high surface energies of metals, fluids would be expected to spread or creep on any truly clean metal surface. Exceptions do occur with certain higher surface tension fluids, usually highly aromatic in molecular structure, certain components of which selectively adsorb onto a surface and create a low surface energy substrate. By modifying in advance the surface of a metal or other solid with a stable, permanent film of low surface energy, it is possible to retard the migration or creep of fluids onto that surface.

THE NYEBAR FILMS

The NyeBar Barrier Films, Type C and Type H, are stable, fluorocarbon polymers with surface energies well below the surface tension (at room temperature) of all known lubricating fluids, including the easily-migrating silicones. The NyeBar polymers are supplied as solutions in fast-evaporating fluorinated or chlorinated carrier solvents. At room temperature the films remaining after evaporation of the solvent will retard spreading or creep of oils across the film surface. Only when the oil is present in a proportion sufficiently large as to literally "fall" across the film does spreading occur.

EFFECT OF INCREASING TEMPERATURE

The surface tension of fluids decreases with increase in temperature. At a certain temperature level, surface tension of any particular oil will equal or drop below the surface energy of a NyeBar film. This temperature becomes the maximum effective use limit of the film for that oil; for each type of film, the limit is usually noted with reference to the methyl silicones, which have the lowest surface tension among the lubricants in common use. Their surface tension reaches the surface energy of NyeBar-Type H at 250°F. and of NyeBar-Type C at 400°F.

HOW TO USE NYEBAR

Either of the NyeBar products can be applied to any clean surface by brushing, spraying or dipping in the solution. Air drying for five minutes or more permits evaporation of the carrier solvent, and a transparent, very thin, but fully effective film will remain.

The NyeBar solution should be applied so as to create a barrier or wall around the area to be lubricated. For a pivot bearing, a simple "doughnut" around the pivot is a useful solution. For irregular orientations of oiled areas, various barrier procedures can be devised. For example, where it is desired to prevent oil from spreading along a rotating shaft, a simple ring around the shaft should suffice.

Because we cannot anticipate or control the many different conditions under which this information and our products may be used, we cannot guarantee the applicability of this information or the suitability of our products in any individual situation. For the same reason, the products discussed are sold without warranty, express or implied. Statements concerning the possible use of our products are not intended as recommendations to use our products in the infringement of any patent.

SKITTERING

The surface energy of a NyeBar film is so low that no wetting occurs when an oil is placed upon it. Skittering can occur, as with mercury on glass, and any oil on such a film is not under control. Therefore, it is recommended that the NyeBar solution always be applied as a wall or barrier around the oiled area. Oil will creep up to this barrier but not across it.

SOLVENTS

The NyeBar films are readily dissolved by fluorinated or chlorinated solvents. NyeBar-Type C is somewhat more resistant than NyeBar-Type H to commonly-used solvents such as naphtha or acetone. It can be attached by prolonged immersion in benzene or ammoniacal cleaning solutions.

TOXICITY - A CAUTION

NyeBar-Type H is supplied as a solution in 1,1,1-trichlorethane, the toxic properties of which are well-known. Concentrations in air should not be permitted above 300 parts per million. NyeBar-Type C is supplied in xylene hexafluoride. The physiological properties of xylene hexafluoride are unknown, but it appears from laboratory use to be no more toxic than carbon tetrachloride. It should be used only by qualified personnel using great care with ventilation sufficient to maintain concentration below 100 parts per million in air. Skin or eye contact must be avoided. In case of eye contact, flush with water and seek medical aid.

PRODUCT CHARACTERISTICS

	<u>Type C</u>	<u>Type H</u>
Solvent	Xylene hexafluoride	1,1,1-trichlorethane
Concentration of Resin in Solvent	2%	2%
Toxicity of Solvent, Max. Allowable Concentration in Air	100 ppm	300 ppm
Temperature Capability of Film	Up to 400°F. with DC200 type silicone oils; higher with higher surface tension oils	Up to 250°F. with DC200 type silicone oils; higher with higher surface tension oils
Surface Energy of Film	Approx. 11 dynes/cm.	Approx. 14 dynes/cm.
Suitable for use with	All known lubricating oils	Petroleum oils Polyglycols Silicones
Limited use with	Possibly certain fluorocarbon oils	Ester or polyester oils (Polar oils may solvate the film.)

PRICES

	<u>NyeBar-Type C</u>	<u>NyeBar-Type H</u>
1/2-oz. vial with applicator	\$6.00 postpaid	-
2-oz. bottle	20.00 "	\$3.00 postpaid
8-oz. bottle	75.00 "	8.30 "
1-quart	225.00 "	21.50 "
1-gallon	-	75.00 "

WILLIAM F. NYE, INC.

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